REMARKS

In the Office Action, claims 107-122 were rejected under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 5,877,851 to Stann et al. in view of the cited Carlson et al. article. Claim 107 was further rejected under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 4,748,634 to Hesterman.

MPEP § 2143 sets the following standard for a finding of obviousness:

> To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations.
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> The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 U.S.P.Q.2d 1438 (Fed. Cir. 1991).

As detailed below, the combination of the Stann and Carlson references do not support a *prima facie* case of obviousness against the claimed subject matter. In particular, the combined teachings of Stann and Carlson do not disclose all the limitations of claims 107-122. Further, the Stann and Carlson references teach away from their respective combination. Finally, the Hesterman reference does not teach all the limitations of claim 107. Given the teachings of the respective cited references, a *prima facie* case of obviousness has not been established.

Claim 107 was rejected under 35 U.S.C. § 103(a) as unpatentable over Stann in view of Carlson. Claim 107 recites a method of efficiently driving a laser diode comprising:

> providing a wideband input signal;

providing a power amplifier with a low output impedance suited to drive a laser diode;

generating a wideband output current from the wideband input signal to modulate the laser diode;

operating the power amplifier as a voltage-controlled current driver for the laser diode.

Stann teaches a chirp signal that requires a subcarrier frequency for the system to operate as described. Specifically, the chirp signal required by Stann uses an amplitude modulated signal which includes a radio-frequency subcarrier that is itself frequency modulated. Col. 1, ll. 17-25. Stann teaches that such a signal is necessary to achieve scannerless three-dimensional imaging of a scene. Importantly, Stann does not teach any method of modulating the laser that would be more efficient than any other method. Stann merely teaches that the laser modulation process described therein is *adopted from other prior art*. Importantly, because Stann does not teach any specific method of driving the laser, Stann does not teach the limitation of "operating the power amplifier as a voltage-controlled current driver for the laser diode." Stann therefore does not teach the specific method of driving the laser diode found in claim 107.

As recognized in the Office Action, Stann also teaches that a matching circuit is necessarily disposed between the wideband RF power amplifier and the laser diode for impedance matching purposes. Col. 3, ll. 14-17. Stann therefore does not teach the limitation of a power amplifier with a low output impedance suited to drive the laser diode.

The Carlson reference fails to fill in the gaps that are not taught by the Stann reference. Carlson teaches a "wideband hybrid laser driver", which is only conceptually described. The specifics of such a hybrid laser driver are largely omitted in the description of the operating requirements. This conceptual hybrid laser driver appears to

be combination of different approaches to driving lasers: (1) a bias tee approach; (2) reactive matching approaches; and (3) stripline matching approaches. Carlson *does not* teach how to combine these approaches or what the results of such a combination would be. The bias tee approach, which is included in the hybrid laser driver (*see* page 413, first full paragraph), includes an impedance matching circuit to match the output impedance of the laser driver with the input impedance of the laser diode. Carlson gives no indication to what extent such impedance matching circuitry is included in the hybrid laser driver. While the Carlson reference conceptually teaches the ideal design requirements of an ideal hybrid laser driver, it does not teach how to construct such a laser driver. See Carlson, at 412, third paragraph, through 413. Carlson also does not include any circuit drawings of the desired hybrid laser driver. Carlson thus lacks significant enabling details that are required to practice the hybrid laser driver discussed therein. *See* MPEP 2121.01. Because it lacks an enabling disclosure of the hybrid laser driver, Carlson does not teach the limitations of "operating the power amplifier as a voltage-controlled current driver for the laser diode" or "providing a power amplifier with a low output impedance suited to drive a laser diode". The combination of the Stann and Carlson references therefore do not establish a *prima facie case* of obviousness over claim 107.

In addition to the above, the Stann and Carlson references teach away from the combination of their respective teachings. The chirp signal taught by Stann is an analogue signal. Col. 2, ll. 48-51. In contrast, the wideband lasers discussed in the Carlson reference are driven using digital signals. Analogue and digital signals are processed in completely different manners when each is used as a source for driving lasers. Therefore, the circuitry that is applicable to one is not well suited for use with the other. For this reason, the Stann and Carlson references teach away from their combination and are not properly combined to establish a *prima facie* case of obviousness over claims 107-122.

Claim 108 depends from claim 107 and includes the additional limitation of selecting minimum, maximum, and average power levels for the laser diode, and modulating the current to the laser diode to cause the laser output to vary between the selected minimum and maximum. The Stann reference teaches an analogue signal with the power output of the laser diode proportional to the driving current derived from the analogue signal. Because Stann teaches an analogue signal, Stann does not teach selecting minimum, maximum, and average power levels for the output of the laser diode. The output of the laser diode in the Stann reference is dictated wholly by the characteristics of the analogue signal, and not by any selected minimum and maximum. Carlson also does not teach this limitation. The combination of the Stann and Carlson references therefore do not establish a *prima facie* case of obviousness over claim 108.

Claims 109 and 110 depend from claim 107, and for the reasons stated above, the combination of the Stann and Carlson references therefore do not establish a *prima facie* case of obviousness over claims 109 and 110.

Claim 111 depends from claim 108 and includes the additional limitation that modulation of the power amplifier output causes the laser drive current to swing from nearly off to the desired output power with an optical extinction ratio of at least 10:1. Again, the Stann reference teaches an analogue signal with the power output of the laser diode proportional to the driving current derived from the analogue signal. Because Stann teaches an analogue signal, Stann does not teach that the laser drive current swings from nearly off to the desired output power. An analogue signal, such as that described in Stann, must be always on to function as described. Carlson also does not teach this limitation. The combination of the Stann and Carlson references therefore do not establish a *prima facie* case of obviousness over claim 111.

Claim 112 depends from claim 107 and includes the additional limitation of providing adaptive control of the output power of the laser driver. Stann teaches that the current level of the power amplifier is varied proportionately to the analogue input signal.

Mere variance of the current level, however, is not adaptive control of the output power. Stann does not in fact teach any adaptive control over the output power. Carlson also does not teach this limitation. The combination of the Stann and Carlson references therefore do not establish a *prima facie* case of obviousness over claim 112.

Claims 113-122 all ultimately depend from claim 107, and for the reasons stated above, the combination of the Stann and Carlson references therefore do not establish a *prima facie* case of obviousness over claims 113-122.

Claim 107 was also rejected as obvious over the Hesterman reference. The Hesterman reference, however, does not teach a wideband input signal, use of a laser diode, or modulation of the laser diode using a wideband output current. The pumping system taught by Hesterman is directed towards igniting and driving high pressure gas lasers, Col. 1, ll. 11-14, and not towards driving laser diodes as is claim 107. Additionally, the input signal taught by Hesterman is sinusoidal, which is effectively a zero bandwidth signal. The laser is started by supplying the input signal at a first frequency that is at a resonant frequency of the laser cavity. Col. 2, l. 48 – Col. 3, l. 35. Following ignition, the frequency of the input signal is shifted to a second frequency which is more appropriate to sustain efficient operation of the gas laser. Col. 3, ll. 36-50.

Further, like the Stann reference, Hesterman teaches that a impedance matching circuit is required to match the output impedance of the power amplifier with the input impedance of the laser. Col. 3, ll. 22-27.

For the above reasons, the Hesterman reference teaches away from and does not teach all the limitations of claim 107. Even when combined with the knowledge of one skilled in the art, the Hesterman reference does not establish a *prima facie* case of obviousness over claim 107.

Based on the foregoing, reconsideration of the rejections is requested.

Respectfully submitted,

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